

IN THE CLAIMS

1. (currently amended) A method for ~~Optimizing Pre-saturation in a scan volume of an MRI system~~, comprising:

a. ~~creating a B_0 magnetic field~~;

~~a. creating~~ b. ~~creating a B_0 map for each slice of the of a scan volume from the B_0 magnetic field, each scan slice having a plurality of positive and negative scan slice pixels~~;

~~b. obtaining~~ c. ~~obtaining a first frequency for RF pre-pulses of RF pre-pulses for each scan slice~~;

~~e. calculating~~ d. ~~calculating a median value for the of the B_0 magnetic field from the B_0 map for each scan slice~~;

~~d. calculating the percentage~~ e. ~~calculating percentages of the positive and negative scan slice pixels in each scan slice~~

2. (currently amended) A method for ~~generating an image of a scan volume using an MRI system, the method~~ comprising the steps of:

a. generating a B_0 field map of each scan slice ~~of the of a scan volume~~ by measuring a B_0 magnetic field ~~distribution~~ over each scan slice of the scan volume, each scan slice having a plurality of positive and negative scan slice pixels;

b. obtaining a first frequency of RF pre-pulses;

c. calculating a median value of the B_0 magnetic field over each scan slice, the calculation being done using the B_0 field maps;

d. calculating ~~the percentage~~ percentages of the positive and negative scan slice pixels in each scan slice, the calculation being done using the $B_{\text{sub-}0}B_0$ field map for each scan slice, wherein a positive scan slice pixel is defined as a scan slice pixel with positive value in the $B_{\text{sub-}0}B_0$ field map, and wherein a negative scan slice pixel is defined as a scan slice pixel with negative value in the $B_{\text{sub-}0}B_0$ field map;

e. ~~if the~~wherein when the percentage of either the positive scan slice pixels or the negative scan slice pixels in each scan slice is greater than a predefined threshold value, performing the step of:

i. calculating a second frequency of RF pre-pulses for each scan slice by correcting the first frequency of RF pre-pulses, the correction for a scan slice being done by using the median value of the $B_{-sub-0}B_0$ magnetic field over the scan slice calculated at step c;

~~else performing the steps of~~otherwise performing:

ii. ~~improving the shimmings~~shimming of the B_0 magnetic field; and

iii. repeating steps a through e; and

f. obtaining an MRI image of each scan slice, wherein the MRI image of a scan slice is obtained using RF pre-pulses at the second frequency for the scan slice.

3. (currently amended) The method of ~~claim 1~~claim 2 wherein the step of calculating a second frequency of RF pre-pulses for a scan slice is done by adding the median value of the $B_{-sub-0}B_0$ magnetic field over the scan slice to the first frequency of RF pre-pulses.

4. (currently amended) The method of claim 1 ~~wherein the~~further comprising applying a plurality of RF pre-pulses ~~are used~~used to suppress magnetic resonance signals from hydrogen nuclei in fat molecules present in the scan volume.

5. (currently amended) The method of claim 1 ~~wherein the~~further comprising applying a plurality of RF pre-pulses are used to suppress magnetic resonance signals from hydrogen nuclei in macromolecules present in the scan volume.

6. (currently amended) The method of claim 1 ~~wherein the~~further comprising applying a plurality of RF pre-pulses are used to suppress magnetic resonance signals from hydrogen nuclei in water molecules present in the scan volume.

7. (currently amended) The method of ~~claim 1~~claim 2 wherein the step of obtaining an MRI image of a scan slice comprises the steps of:

- a. applying
 - i. ~~RE pre-pulses~~RF pre-pulses at second frequency for the scan slice; and
 - ii. ~~RE-pulses~~RF pulses at transmit frequency to the scan slice;
- b. measuring magnetic resonance signals from the scan slice; and
- c. processing the magnetic resonance signals to obtain an MRI image of the scan slice.

8. (currently amended) A method ~~for generating an image of a scan volume using an MRI system, the method~~ comprising the steps of:

- a. generating a ~~B-sub-0~~B₀ field map of each scan slice ~~of the~~of a scan volume by measuring ~~B-sub-0~~a B₀ magnetic field ~~distribution~~ over each scan slice of the scan volume and storing the ~~B-sub-0~~B₀ field map in a database, each scan slice having a plurality of positive and negative scan slice pixels;
- b. obtaining a first frequency of RF pre-pulses for each scan slice;
- c. calculating median value of the ~~B-sub-0~~B₀ magnetic field over each scan slice, the calculation being done using the ~~B-sub-0~~B₀ field maps stored in the database;
- d. calculating ~~the percentage~~percentages of the positive and negative scan slice pixels in each scan slice, the calculation being done using the ~~B-sub-0~~B₀ field map for each scan slice, wherein a positive scan slice pixel is defined as a scan slice pixel with positive value in the ~~B-sub-0~~B₀ field map, and wherein a negative scan slice pixel is defined as a scan slice pixel with negative value in the ~~B-sub-0~~B₀ field map;
- e. ~~if the~~wherein when the percentage of either the positive scan slice pixels or the negative scan slice pixels in each scan slice is greater than a predefined threshold value, performing the step of:

i. calculating a second frequency of RF pre-pulses for each scan slice by correcting the first frequency of RF pre-pulses, the correction for a scan slice being done by adding the median value of the $B_{-sub.0}B_0$ magnetic field over the scan slice calculated at step c to the first frequency of RF pre-pulses calculated at step b;

~~else performing the steps of~~otherwise performing:

ii. improving ~~the shimming~~shimming of the B_0 magnetic field;
and

iii. repeating steps a through e;

f. obtaining an MRI image of each scan slice using RF pre-pulses at second frequency for that scan slice;

g. storing the MRI image of each scan slice obtained at step f in the database; and

h. displaying the MRI images stored in the database on a display device.

9. (currently amended) The method of ~~claim 7~~claim 8 wherein the RF pre-pulses are used to suppress magnetic resonance signals from hydrogen nuclei in fat molecules present in the scan volume.

10. (currently amended) The method of ~~claim 7~~claim 8 wherein the step of obtaining an MRI image of a scan slice comprises the steps of:

a. applying

i. RF pre-pulses at second frequency for the scan slice; and

ii. ~~RF pulses~~RF pulses at transmit frequency to the scan slice;

b. measuring magnetic resonance signals from the scan slice; and

c. processing the magnetic resonance signals to obtain an MRI image of the scan slice.

11. (currently amended) An MRI system comprising:

- a. a polarizing magnet ~~for producing~~configured to produce a high intensity magnetic field called ~~B-sub.0~~a B_0 magnetic field;
- b. a set of shimming coils ~~for improving B-sub.0~~configured to improve homogeneity of the B_0 magnetic field homogeneity;field;
- c. a magnetic field detector ~~for measuring B-sub.0~~configured to measure a B_0 magnetic field distribution from the B_0 magnetic field;
- d. a set of gradient coils ~~for producing~~configured to produce a gradient magnetic field superposed on the ~~B-sub.0~~ B_0 magnetic field;
- e. a transmitter ~~for generating~~configured to generate RF pulses and RF pre-pulses wherein frequency of RF pre-pulses is specific for each scan slice, each scan slice having a plurality of positive and negative scan slice pixels;
- f. a radio frequency receiver ~~for detecting~~configured to detect magnetic resonance signals;
- g. a processing module comprising:
 - i. a module ~~for calculating~~configured to calculate the median of the ~~B-sub.0~~ B_0 magnetic field over each scan slice;
 - ii. a module ~~for calculating the percentage~~configured to calculate percentages of the positive and negative scan slice pixels in each scan slice, wherein positive scan slice pixels are defined as scan slice pixels with positive ~~B-sub.0~~ B_0 magnetic field values, and wherein negative scan slice pixels are defined as scan slice pixels with negative ~~B-sub.0~~ B_0 magnetic field values;
 - iii. a module ~~for calculating~~configured to calculate a second frequency of RF pre-pulses for each scan slice by adding the median value of the ~~B-sub.0~~ B_0 magnetic field over the scan slice to a first frequency of RF pre-pulses, the first frequency of RF pre-pulses being obtained by a standard procedure; and

iv. a module ~~for processing~~configured to process magnetic resonance signals from a scan slice to obtain an MRI image of ~~the scan slice pulses~~ for each scan slice; and

h. a database comprising:

i. a storage unit ~~for storing B_{sub-0}~~ configured to store B_0 field maps;

ii. a second storage unit ~~for storing~~configured to store the median value of the ~~B_{sub-0}~~ B_0 magnetic field over each scan slice; and

iii. a third storage unit ~~for storing~~configured to store an MRI image of each scan slice.

12. (currently amended) A computer program product for use with a computer, the computer program product comprising a computer usable medium having a computer readable program code embodied therein for generating an image using an MRI system, the computer program code performing the steps of:

a. generating a ~~B_{sub-0}~~ B_0 field map of each scan slice ~~of the~~of a scan volume by measuring ~~B_{sub-0}~~ B_0 magnetic field ~~distribution~~ over each scan slice of the scan volume, each scan slice having a plurality of positive and negative scan slice pixels;

b. obtaining a first frequency of RF pre-pulses;

c. calculating median value of the ~~B_{sub-0}~~ B_0 magnetic field over each scan slice, the calculation being done using the ~~B_{sub-0}~~ B_0 field maps;

d. calculating ~~the percentage~~percentages of the positive and negative scan slice pixels in each scan slice, the calculation being done using the ~~B_{sub-0}~~ B_0 field map for each scan slice, wherein a positive scan slice pixel is defined as a scan slice pixel with positive value in the ~~B_{sub-0}~~ B_0 field map, and wherein a negative scan slice pixel is defined as a scan slice pixel with negative value in the ~~B_{sub-0}~~ B_0 field map;

e. ~~if the~~wherein when the percentage of either the positive scan slice pixels or the negative scan slice pixels in each scan slice is greater than a predefined threshold value, performing the step of:

i. calculating a second frequency of RF pre-pulses for each scan slice by correcting the first frequency of RF pre-pulses, the correction for a scan slice being done by adding the median value of the $B_{-sub-0}B_0$ magnetic field over the scan slice to the first frequency of RF pre-pulses;

~~else performing the steps of~~otherwise performing:

ii. improving ~~the shimmings~~shimming of the B_0 magnetic field;
and

iii. repeating steps a through e; and

f. obtaining an MRI image of each scan slice, wherein the MRI image of a scan slice is obtained using RF pre-pulses at the second frequency for the scan slice.

13. (currently amended) A computer program product for use with a computer, the computer program product comprising a computer usable medium having a computer readable program code embodied therein for acquiring an image using an MRI system, the computer program code performing the steps of:

a. generating a $B_{-sub-0}B_0$ field map of each scan slice ~~of the~~of a scan volume by measuring $B_{-sub-0}B_0$ magnetic field ~~distribution~~ over each scan slice of the scan volume and storing the $B_{-sub-0}B_0$ map in a database, each scan slice having a plurality of positive and negative scan slice pixels;

b. obtaining a first frequency of RF pre-pulses for each scan slice;

c. calculating median value of the $B_{-sub-0}B_0$ magnetic field over each scan slice, the calculation being done using the $B_{-sub-0}B_0$ field maps stored in the database;

d. calculating ~~the percentage~~percentages of the positive and negative scan slice pixels in each scan slice, the calculation being done using the $B_{-sub-0}B_0$ field

map for each scan slice, wherein a positive scan slice pixel is defined as a scan slice pixel with positive value in the $B_{-sub-0}B_0$ field map, and wherein a negative scan slice pixel is defined as a scan slice pixel with negative value in the $B_{-sub-0}B_0$ field map;

e. ~~if the~~ wherein when the percentage of either the positive scan slice pixels or the negative scan slice pixels in each scan slice is greater than a predefined threshold value, performing the step of:

i. calculating a second frequency of RF pre-pulses for each scan slice by correcting the first frequency of RF pre-pulses, the correction for a scan slice being done by adding the median value of the $B_{-sub-0}B_0$ magnetic field over the scan slice to the first frequency of RF pre-pulses;

~~else performing the steps of~~ otherwise performing:

ii. ~~improving the shimmings~~ shimming of the B_0 magnetic field;
and ~~in repeating~~ repeating steps a through e;

f. obtaining an MRI image of each scan slice using RF pre-pulses at second frequency for that scan slice calculated at step e;

g. storing the MRI image of each scan slice obtained at step f in the database; and

h. displaying the MRI images stored in the database on a display device.